a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and

B5 cmd.

a topping heater, said topping heater capable of raising the temperature of said feed water so that said feed water in said high temperature water cracking system is at least about 850°C, said feed water input line coupled to said steam generator, said topping heater, and said high temperature water cracking system.

Remarks

The Office Action dated March 19, 2002 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1-35 are pending in this application. Claims 1-11 and 25-33 stand rejected. Claims 12-24 and 34-35 are withdrawn from consideration.

Submitted herewith is a Submission Of Marked Up Paragraphs and Claims in accordance with 37 C.F.R. § 1.121(c)(1)(ii).

The objection to the disclosure for various informalities is respectfully traversed.

The paragraph starting on line 11 of page 2 has been amended to correct a typographical error. The paragraphs starting on line 3 and on line 15 of page 4 have been amended to correct typographical errors.

For the reasons set forth above, Applicants respectfully request that the objection to the specification be withdrawn.

The rejection of Claims 1-11 and 25-33 under 35 U.S.C. § 103(a) as being unpatentable over Koutz (4,576,783) is respectfully traversed.

Koutz describes a system for increasing the temperature of a fluid heated by a high temperature gas cooled nuclear reactor. The system includes a high temperature gas cooled nuclear reactor and a secondary closed loop of a working fluid. The fluid in the closed loop is heated in an intermediate heat exchanger in communication with the reactor coolant. The system also includes a heat pump to heat the working fluid to about 1500°F. The working fluid is then passed through a hydrogen production generator where the working fluid transfers heat to the hydrogen production generator. The working fluid in the closed loop then passes through a turbine, which is part of the heat pump, which cools the working fluid to about 1080°F. The working fluid is then passed through a steam generator to heat feed water for the hydrogen production generator to about 900°F, and is then directed back to the intermediate heat exchanger.

Claim 1 of the present application recites a system for generating hydrogen that includes feed water, a liquid metal nuclear reactor having a non-radioactive secondary heat loop, and a steam generator connected to the secondary heat loop. The steam generator is capable of raising the temperature of the feed water. The system also includes a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line, and a topping heater. The topping heater is capable of raising the temperature of the feed water, and the feed water input line is coupled to the steam generator, the topping heater, and the high temperature water cracking system.

Claim 25 of the present application recites a system for generating hydrogen that includes feed water, a liquid metal nuclear reactor having a non-radioactive secondary heat loop, and a steam generator connected to the secondary heat loop. The steam generator is capable of raising the temperature of the feed water to between about 450°C to about 550°C. The system also

includes a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line, and a topping heater. The topping heater is capable of raising the temperature of the feed water so that the feed water in the high temperature water cracking system is at least about 850°C. The feed water input line is coupled to the steam generator, the topping heater, and the high temperature water cracking system.

Applicants respectfully submit that the Section 103 rejection of the presently pending claims is not a proper rejection. As is well established, the mere assertion that it would have been obvious to one of ordinary skill in the art to have modified Koutz to obtain the claimed recitations of the present invention does not support a *prima facie* obvious rejection. Rather, each allegation of what would have been an obvious matter of design choice must always be supported by citation to some reference work recognized as standard in the pertinent art and the Applicants given the opportunity to challenge the correctness of the assertion or the notoriety or repute of the cited reference. Applicants have not been provided with the citation to any reference supporting the combination made in the rejection. The rejection, therefore, fails to provide the Applicants with a fair opportunity to respond to the rejection, and fails to provide the Applicants with the opportunity to challenge the correctness of the rejection.

Further, Applicants respectfully submit that modifying Koutz by substituting a liquid metal reactor for the high temperature gas cooled reactor and by substituting a topping heater for the heat pump does not describe nor suggest a system for generating hydrogen as recited in Claim 1 or as recited in Claim 25. Particularly, modified Koutz has a closed loop heating circuit 22 that includes a working fluid that is heated by the heat exchanger (steam generator) 20, passes through the heat pump (topping heater) 28 where it is heated further, passes through the hydrogen production generator 30 to provide heat to the hydrogen production generator, passes

through a steam generator 38 to add heat to the feed water, and then is circulated back to the heat exchanger (steam generator) 20. In contrast, the system recited in Claim 1 or Claim 25 does not include a closed loop heating circuit that utilizes a working fluid. Rather, in the claimed system, the feed water is directed through an input line to the steam generator connected to the reactor secondary heat loop, the feed water is then directed through the input line to the topping heater, and then directed through the input line into the high temperature water cracking system (see Figure 1). In the modified Koutz system the feed water input line is not coupled to the steam generator connected to the reactor secondary heat loop, and the feed water does not pass through the heat exchanger connected to the reactor secondary heat loop. Also, the feed water input line is not coupled to the heat pump (topping heater). Accordingly, Applicants respectfully submit that Claims 1 and 25 are patentable over Koutz.

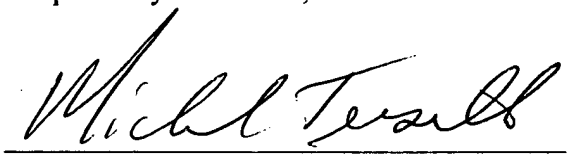
Claims 2-11 depend from independent Claim 1 and Claims 26-33 depend from independent Claim 25. When the recitations of dependent Claims 2-11 and 26-33 are considered in combination with the recitations of Claims 1 and 25 respectively, Applicants respectfully submit that Claims 2-11 and 26-33 likewise are patentable over Koutz.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1-11 and 25-33 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Favorable action is respectfully

solicited.

Respectfully submitted,



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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Boardman et al.

Serial No.: 09/735,009

Filed: December 12, 2000

For: SYSTEM AND METHODS OF PRODUCING HYDROGEN USING A NUCLEAR REACTOR

Art Unit: 3641

Examiner: R. Palabrica

SUBMISSION OF MARKED UP PARAGRAPHS AND CLAIMS

Commissioner for Patents
Washington, D.C. 20231

A marked-up version of amended paragraphs starting on line 11 of page 2, on line 3 of page 4, and on line 15 of page 4, and amended Claims 1 and 25 in accordance with 37 C.F.R. § 1.121(c)(1)(ii), follows below.

MARKED UP SPECIFICATION

At page 2, please delete the paragraph starting on line 11 and replace with the following paragraph.

In one embodiment, the topping heater is a gas fired heater. A portion of the oxygen and hydrogen produced by the high temperature water cracking system is used as fuel in the topping heater. The exhaust from the gas fired [toping] topping heater is directed to a regenerative heat exchanger. The regenerative heat exchanger is located in the feed water supply line and is positioned between the steam generator and the topping heater. The exhaust from the gas fired topping heater is then directed to a second regenerative heat exchanger which is used to increase

the temperature of a portion of the feed water that has been converted to steam by the steam generator before it enters a steam turbine generator assembly for generating electricity.

At page 4, please delete the paragraph starting on line 3 and replace with the following paragraph.

System 10 includes a feed water source 30 which is coupled to steam generator 16 by a feed water line 32. Feed water source 30 can be, for example, a body of water, a desalination plant, a water clean-up system, a steam turbine condenser, or a combination thereof. The water from feed water source 30 is heated in steam[,] generator 16 and converted to steam. A portion of the heated feed water, or steam, from steam generator 16 is directed to cracking system 18 and a portion of the steam is directed to a steam turbine and generator assembly 34. A condenser 36 is coupled to steam turbine and generator assembly 34. The spent steam from steam turbine 34 is condensed in condenser 36. A condenser output line 38 is connected to feed water line 32 so that the condensed steam can be added to the feed water. Condenser 36 includes water circulating lines 37, and a water line 39 connects water circulating lines 37 with desalination plant 30 to supply make-up water to plant 30.

At page 4, please delete the paragraph starting on line 15 and replace with the following paragraph.

Topping heater 20 is a gas fired heater. However, in alternative embodiments, as shown in Figures 2 and 3, topping heater 20 can be an electric heater. A portion of the oxygen and hydrogen produced in water cracking system 18 is directed to topping heater 20 and used as fuel for heater 20. Exhaust from gas fired [toping] topping heater 20 is directed to a regenerative heat exchanger 40 through exhaust line 42. Regenerative heat exchanger 40 further heats the portion

of the steam output from steam generator 16 that is directed to cracking system 18. A steam line 44 connects regenerative heat exchanger 40 to steam generator 16. The output from regenerative heat exchanger 40 is directed to topping heater 20 through a steam line 46. Topping heater 20 heats the output from regenerative heat exchanger 40 to at least 850°C. High temperature water cracking system 18 uses the steam heated to at least 850°C as a feed to produce oxygen and hydrogen. Water cracking system 18 can be any known high temperature water cracking system that uses heat energy to disassociate water into hydrogen and oxygen.

MARKED UP CLAIMS

1. (amended) A system for generating hydrogen comprising:

feed water;

a liquid metal nuclear reactor having a non-radioactive secondary heat loop;

a steam generator connected to said secondary heat loop, said steam generator capable of raising the temperature of said feed water;

a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and

a topping heater, said [toping] topping heater capable of raising the temperature of said feed water, said feed water input line coupled to said steam generator, said topping heater, and said high temperature water cracking system.

25. (amended) A system for generating hydrogen comprising:

feed water;

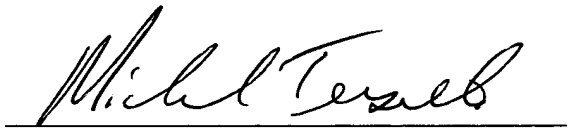
a liquid metal nuclear reactor having a non-radioactive secondary heat loop;

a steam generator connected to said secondary heat loop, said steam generator capable of raising the temperature of said feed water to between about 450°C to about 550°C;

a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and

a topping heater, said [toping] topping heater capable of raising the temperature of said feed water so that said feed water in said high temperature water cracking system is at least about 850°C, said feed water input line coupled to said steam generator, said topping heater, and said high temperature water cracking system.

Respectfully submitted,



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